

REMARKS

Claims 19, 23, 28, and 32 are pending in the Subject Application and stand rejected. New claims 33 and 34 are added. Applicants respectfully traverse the rejections of claims 19, 23, 28, and 32.

Basis for new claims 33 and 34 can be found on page 10-11 in connection with the description of Figure 2. *See* in particular, page 11, lines 11-13.

35 U.S.C. §103(a)

The Examiner rejected claims 19, 23, 28, and 32 under 35 U.S.C. §103(a) as being unpatentable over Parsley, U.S. Published Application No. 2004/0244973 ("Parsley") in view of Bohn, U.S. Patent No. 6,306,917 ("Bohn"). The Examiner acknowledges that "Parsley does not disclose the separation of hydrogen or means for introducing hydrogen into the F-T loop to adjust the ratio of H₂/CO." The Examiner contends, however, that Bohn discloses separating hydrogen and introducing it to the FT loop to adjust the ratio of H₂/CO in order to recycle gases and increase the H₂:CO ratio in the synthesis gas and that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Parsley by including a hydrogen recycle line as taught by Bohn in order to recycle gas and increase the H₂:CO ratio in the synthesis gas. Applicants respectfully disagree.

Parsley teaches adjusting the H₂:CO ratio by the addition of steam and/or CO₂ to the hydrocarbonaceous feed stream that is introduced into the oxidation reactor to produce synthesis gas for the FT reactor. Although heavy hydrocarbons are mentioned as possible feedstock materials, the preferred feedstock is methane, natural gas, associated gas or a mixture of C₁₋₄ hydrocarbons. Parsley states that the feedstock typically has an H₂:CO ratio between 1:1 to 3:1, and preferably 2:1. *See* page 3, paragraphs 0027, 0028 and 0030. Natural gas has a high H:C ratio (4:1 for the main component, methane).

Bohn is directed to an apparatus and a Fischer-Tropsch process using an iron catalyst for producing power, liquid hydrocarbons and CO₂ from heavy feedstock, such as crude oil having a

high content of sulfur. At col. 6, beginning at line 7, Bohn teaches that the carbon-bearing feedstock has an H:C ratio of less than 2.0. The carbon-bearing feedstock is converted to synthesis gas by partial oxidation and water gas shift reactions. Heavy hydrocarbons have a relatively low H:C ratio, close to 2:1, which means that the H₂:CO content of the resulting syngas is relatively low. Bohn teaches at col. 6, line 14 that mixture has a molar ratio of H₂:CO of greater than 0.6. Bohn goes on to say that the iron-based catalysts of the Bohn process allow the production of FT liquids from syngases with low H₂:CO ratios, such as those obtained from high carbon feed stocks. Bohn teaches that hydrogen may be recycled from the FT product stream to the FT feed to *increase* the H₂:CO ratio of the syngas fed to the FT reactor to improve the yield of FT liquids.

According to the teachings in Parsley, hydrogen recycling would not be necessary because the required H₂:CO ratio is higher to begin with due to the differences in feedstock, and importantly, because Parsley teaches that the H₂:CO ratio may be adjusted by adding one or both of steam and CO₂ to the feed stream for production of synthesis gas. Parsley adjusts the ratio by adding more CO in the form of CO₂ or more hydrogen and oxygen in the form of steam. Any required adjustment in the ratio is obtained by increasing the amount of steam to increase the water gas shift reaction. Parsley in fact *teaches away* from adding more hydrogen alone. One skilled in the art would not be motivated to combine the hydrogen recycling taught by Bohn for increasing the ratio of H₂:CO in the process taught by Parsley because it isn't necessary.


Applicants submit that the combination of Parsley and Bohn do not teach or suggest the subject matter of independent claims 23 and 32. Claims 23 and 32 are believed to be in condition for allowance. Claim 19 and new claim 33 depend from claim 23. Claim 28 and new claim 34 depend from claim 32. Each of the dependant claims includes all of the limitations of their respective base claims. Claims 19, 33, 28 and 34 are also believed to be in condition for allowance.

CONCLUSION

Applicants have made every effort to advance prosecution of the Subject Application. No new matter is introduced by the amendments. Claims 19, 23, 28 and 32 recite a novel and nonobvious invention and are in condition for allowance.

If the undersigned can be of any assistance to the Examiner in addressing any remaining issues, the Examiner is urged to please contact the undersigned attorney at the number set forth below.

Respectfully submitted,


Christine R. Ethridge
Registration No. 30,557

Attorney for Applicants

K&L Gates LLP
Henry W. Oliver Building
535 Smithfield Street
Pittsburgh, Pennsylvania 15222-2312

(412) 355-8619
(412) 355-6501 (FAX)